ADDENDUM #1

SAFETY ANALYSIS REPORT

FOR THE

HN-100 SERIES 2 RADWASTE SHIPPING CASK

REFERENCING

10 CFR 71 TYPE "A" PACKAGING REGULATIONS

HITTMAN NUCLEAR & DEVELOPMENT CORPORATION
COLUMBIA, MARYLAND 21045

Spec. No. N/A
Addendum #1
8/28/78
5/9/79 - Revision 1

STRESS ANALYSIS

HN-100 SERIES 2 CASK

ADDENDUM #1

REVISION LOG

REV.	DATE	ENGINEERING	Q.A.	PROJ. MGR.	ECN #
0	8/28/78	George Trigilio	R Rhodes	George Trigilio	—
1	5/9/79	George Trigilio	[illegible]	George Trigilio	79-066

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INTRODUCTION

This addendum to the Safety Analysis Report for the Hittman Nuclear & Development Corporation HN-100, Series 2 Radwaste Shipping Cask is issued to remove the restriction requiring Type "A" inner containers. This addendum addresses the lid seal integrity during the calculated free drop. The following calculations are intended to be a supplement to Section 3.2.6 of the original Safety Analysis Report.

Cask HN-100, Series 2, Stress Analysis
Gasket Spacer

The gasket redesign requires a protective steel spacer. The spacer is in the form of a ring and is welded to the top of the case where the lid interfaces with the case. See Figure R-1. The lid compresses the gasket and bottoms on the spacer.

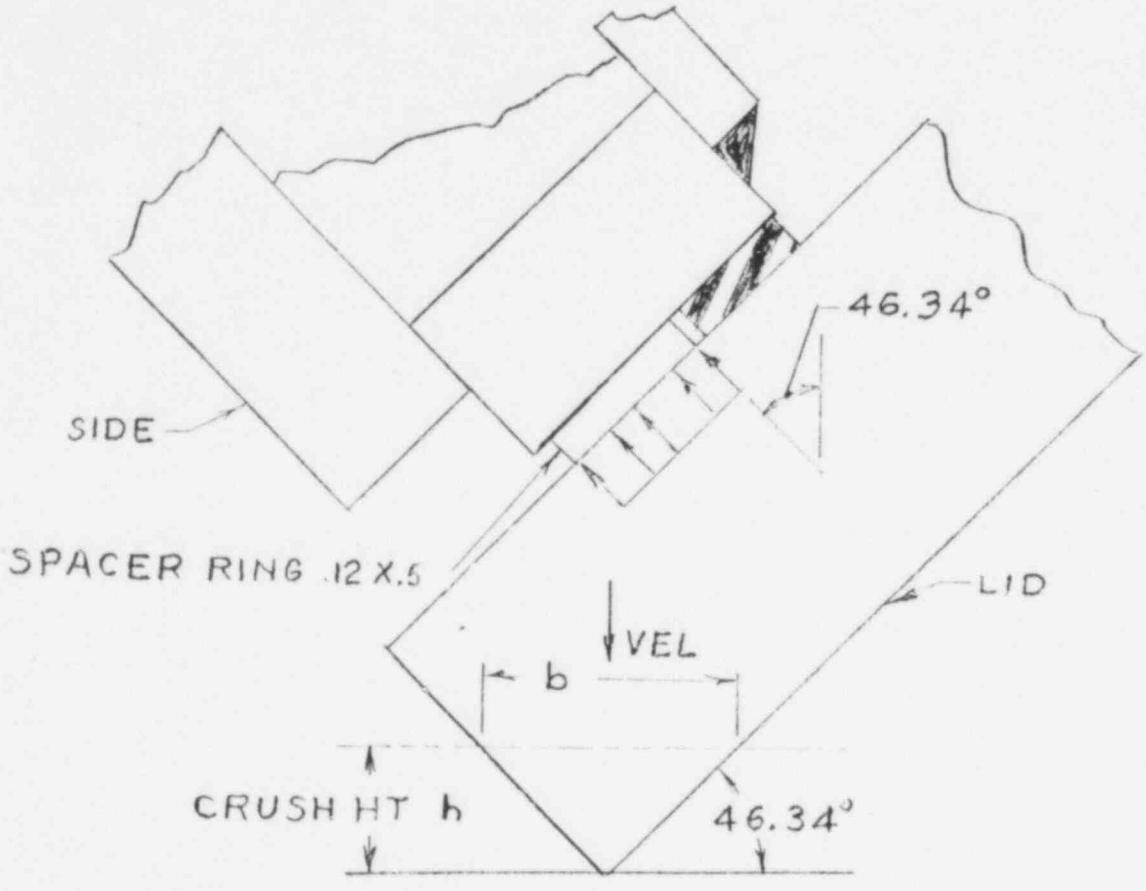

Figure R-1. Cross Section of Upper Case

The worst case causing stress on the spacer is the edge drop. The deceleration is greatest here and the CG is directly over the edge.

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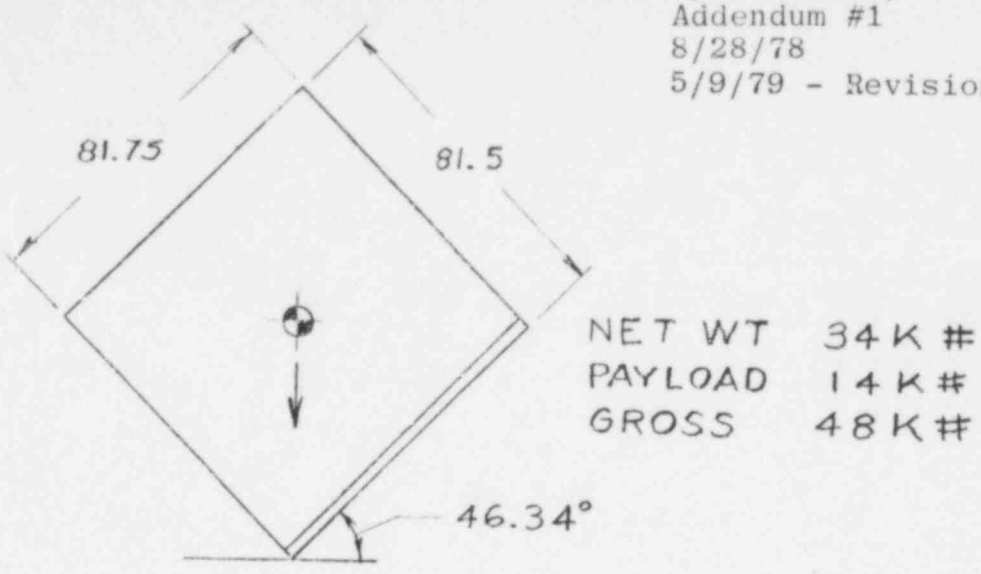

Figure R-2. Position of Cask at Edge Drop

The drop height of 12" and a gross weight of 48,000# yields a kinetic energy KE = (12)(48000) = 576,000#-in.

The flow stress is 45,000#, giving a displacement V of:

$$V = \frac{576,000}{45,000} = 12.8 \text{ in.}^3$$

The volume displaced is in the shape of a prism with a triangular cross section of the length L of the edge.

$$L = (85.38)(\tan 22.5^{o}) = 35.4 \text{ in.}$$

Therefore, the volume is bhL/2. See Figure R-1. The base b is:

$$b = \frac{h}{0.499}$$

Therefore:

$$V = bhL/2$$

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$$b = h/0.499$$

$$v = h^2L/(2)(0.499)$$

$$h = \sqrt{\frac{(0.998)(12.8)}{35.4}}$$

$$h = 0.601 \text{ in.}$$

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The maximum deceleration Ag is twice the drop height H divided by the displacement height h.

$$Ag = 2H/h = (2)(12)/0.601 = 39.9g's$$

Deduct the mass of the lid and payload, since these do not contribute to loading on the spacer. Lid weight is 7000#, therefore net weight Wn is:

$$Wn = 34,000-7,000 = 27,000\#$$

Stress on 35.4 in. length of spacer is:

$$S_{sp} = \frac{P}{A} = \frac{(27000)(39.9\ g's)(\cos 46.34^{o})}{(0.50)(35.4)}$$

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$$S_{sp} = 42,020 \text{ psi}$$

The bearing strength of A-36 is 90,000 psi. Therefore the M.S.:

$$M.S. = \frac{90,000}{42,020} - 1 = + 1.14$$

The following is intended to be a supplement to Section 2.1 of the original Safety Analysis Report.

Item 2.1.1 Drain Plug Option

HN-100 Series 2 casks have two (2) possible drain plug configurations. Option #1 details the drain plug being inserted at an angle to the horizontal plane of the cask bottom and positioned between the tie-down support axis. Option #2 shows the drain plug entering horizontal to the cask bottom with a double plug configuration. This second option locates the drain plug approximately 90° from Option #1. The Option #2 configuration enhances the ability to drain the cask with minimum operational exposure. 1

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